Film-Tech

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S O U N D

DIGITAL THEATER SYSTEMS

Digital Sound For Movies

P8 DIGITAL AUDIO REPRODUCER
USERS MANUAL
PROGRAM VERSION 2.04

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I   P8 DIGITAL REPRODUCER OVERVIEW

The P8 is an 8 track digital audio reproducer for specialty applications. It has a serial interface that is a subset of the Pioneer 8000 LDP command set. It reads either SMPTE timecode, DTS timecode, a low bit rate packed BCD timecode, or tach. All except SMPTE are translated to SMPTE by the P8 so that other devices may follow.
Audio storage alternatives are hard disk or CD-ROM.

Audio can be recorded to hard disc on the P8 if an optional record card is installed. The input can be either Sony 3324/3348 format, or AES-EBU format. For CD-ROM based systems, the transfers and CD-ROMS are done by either DTS or a DTS-equipped studio. Consult DTS for specific information regarding your transfer needs.

II   QUICK START, CD-ROM VERSION

Connect a VGA monitor and keyboard to the computer. Connect at least audio channel one to an amplifier and speaker (Refer to the 8 CHANNEL REPRODUCER pinout). Mute the amplifier. Turn on the computer. Insert the test CD-ROM caddy in either drive. After a few seconds, the computer will go through its startup sequence and access the drive. The P8 program will start.

In the key sequences below, F1-F11 refer to the function keys. RETURN refers to the <ENTER> or < RETURN> key. For function keys that require numeric input, type digits in to the entry register, then press the function key.

KEY STROKES	ACTION
2 F8	select generator mode
F1	select play menu
1 RETURN	select tones file (assuming TONES is first in list)
F2	play tones file

III   FRONT PANEL INDICATORS

INDICATOR	FUNCTION
red LED	FAIL indicator. When lit, there is either; 1) a hardware problem; 2) the user has removed the disc to be played or 3) no discs are in.
yellow LED (optional)	READY indicator. A sound file has been selected and is ready to play.
green LED	PLAY indicator.

IV BOARD COMPLEMENT, PINOUTS, AND SWITCH SETTINGS

A) **HOST ADAPTER**

Different host adapters are used for different applications. For CD-ROM based applications, the Future Domain 850 host adapter is used. For hard disk based applications, the Adaptec 1542 host adapter is used.

B) **VGA ADAPTER**

The VGA adapter is generic. It is used for text only.

C) **SERIAL CARD**

SERIAL CONNECTOR (9 PIN D MALE)

PIN	SIGNAL
1)	
2)	RX
3)	TX
4)	
5)	GND
6)	
7)	RTS
8)	CTS
9)	

Note: The serial card is generic. COM1 is used. The serial port is set for 9600 baud, 8 bits, no stop bit. The P8 emulates the Pioneer 8000 LDP. Commands relating to time are sent and received as timecode numbers rather than frame numbers.

D)   **TIMECODE READER**

The **tach** inputs are TTL levels, 0 to 5 volts maximum.
The **timecode** inputs are AC coupled, 100mV to 5V maximum. The tach inputs have a quadrature deglitching filter, and will read quadrature only (not tach and direction).

PIN	SIGNAL
1)	FAIL WIPER
2)	TIMECODE IN+
3)	SMPTE TIMECODE OUT
4)	TACH PHASE 2 IN
5)	GROUND
6)	FAIL CLOSURE
7)	TIMECODE IN-
8)	+5 VOLTS UNFUSED
9)	TACH PHASE 1 IN

E)   **8 CHANNEL REPRODUCER**

AUDIO OUTPUT CONNECTOR (15 PIN D FEMALE)

PIN	SIGNAL
1)	CHANNEL 1+
2)	CHANNEL 2+
3)	CHANNEL 3+
4)	CHANNEL 4+
5)	CHANNEL 5+
6)	CHANNEL 6+
7)	CHANNEL 7+
8)	CHANNEL 8+
9-15)	AUDIO GROUND

F)   8 CHANNEL OPTO INPUT/ RELAY OUTPUT 1 (OPTIONAL)

ADDRESS SWITCH SETTING: HEX 310

PIN	SIGNAL	INPUT/OUTPUT
1)	SEARCH 3+	INPUT
2)	SEARCH 1+	INPUT
3)	START+	INPUT
4)	PLAY+	INPUT
5)	SEARCH 4+	INPUT
6)	SEARCH 2+	INPUT
7)	SEARCH 0+	INPUT
8)	STOP+	INPUT
9)	OUTPUT7 (C)	SPARE OUTPUT
10)	OUTPUT6 (C)	SPARE OUTPUT
11)	OUTPUT5 (C)	SPARE OUTPUT
12)	OUTPUT4 (N/C)	SPARE OUTPUT
13)	OUTPUT4 (N/O)	SPARE OUTPUT
14)	OUTPUT3 (C)	SPARE OUTPUT
15)	OUTPUT2 (N/C)	SPARE OUTPUT
16)	OUTPUT2 (N/O)	SPARE OUTPUT
17)	PLAY (C)	OUTPUT
18)	READY RELAY (N/C)	OUTPUT
19)	READY RELAY (N/O)	OUTPUT
20)	SEARCH 3-	INPUT
21)	SEARCH 1-	INPUT
22)	START-	INPUT
23)	PLAY-	INPUT
24)	SEARCH 4-	INPUT
25)	SEARCH 2-	INPUT
26)	SEARCH 0-	INPUT
27)	STOP-	INPUT
28)	OUTPUT7 (N/O)	SPARE OUTPUT
29)	OUTPUT6 (N/O)	SPARE OUTPUT
30)	OUTPUT5 (N/O)	SPARE OUTPUT
31)	OUTPUT4 (C)	SPARE OUTPUT
32)	OUTPUT3 (N/C)	SPARE OUTPUT
33)	OUTPUT3 (N/O)	SPARE OUTPUT
34)	OUTPUT2 (C)	SPARE OUTPUT
35)	PLAY RELAY (N/C)	OUTPUT
36)	PLAY RELAY (N/O)	OUTPUT
37)	READY RELAY(C)	OUTPUT

G)   8 CHANNEL OPTO INPUT/ RELAY OUTPUT 2 (OPTIONAL)

ADDRESS SWITCH SETTING: HEX 314

PIN	SIGNAL	INPUT/OUTPUT
1)	SEARCH 8+	INPUT
2)	SEARCH 6+	INPUT
3)	INPUT5+	SPARE INPUT
4)	INPUT4+	SPARE INPUT
5)	SEARCH 9+	INPUT
6)	SEARCH 7+	INPUT
7)	SEARCH 5+	INPUT
8)	INPUT0+	SPARE INPUT
9)	OUTPUT7 (C)	SPARE OUTPUT
10)	OUTPUT6 (C)	SPARE OUTPUT
11)	OUTPUT5 (C)	SPARE OUTPUT
12)	OUTPUT4(N/C)	SPARE OUTPUT
13)	OUTPUT4 (N/O)	SPARE OUTPUT
14)	OUTPUT3 (C)	SPARE OUTPUT
15)	OUTPUT2 (N/C)	SPARE OUTPUT
16)	OUTPUT2 (N/O)	SPARE OUTPUT
17)	OUTPUT1 (C)	SPARE OUTPUT
18)	OUTPUT0 (N/C)	SPARE OUTPUT
19)	OUTPUT0 (N/O)	SPARE OUTPUT
20)	SEARCH 8-	INPUT
21)	SEARCH 6-	INPUT
22)	INPUT5-	SPARE INPUT
23)	INPUT4-	SPARE INPUT
24)	SEARCH 9-	INPUT
25)	SEARCH 7-	INPUT
26)	SEARCH 5-	INPUT
27)	INPUT0	SPARE INPUT
28)	OUTPUT7 (N/O)	SPARE OUTPUT
29)	OUTPUT6 (N/O)	SPARE OUTPUT
30)	OUTPUT5 (N/O)	SPARE OUTPUT
31)	OUTPUT4 (C)	SPARE OUTPUT
32)	OUTPUT3 (N/C)	SPARE OUTPUT
33)	OUTPUT3 (N/O)	SPARE OUTPUT
34)	OUTPUT2 (C)	SPARE OUTPUT
35)	OUTPUT1 (N/C)	SPARE OUTPUT
36)	OUTPUT1 (C)	SPARE OUTPUT
37)	OUTPUT0 (C)	SPARE OUTPUT

H) **SUGGESTED SLOT ASSIGNMENTS**

SLOT	CARD DESCRIPTION	MFG	CONNECTOR
1	8 CHANNEL REPRODUCER	DTS	15 PIN 'D' FEMALE
2	EMPTY SLOT		
3	8 CLOSURE I/0 CARD 1	COMPUTERBOARDS, ADDR 310	37 PIN 'D' MALE
4	TIMECODE CARD	DTS	9 PIN 'D' FEMALE
5	VGA ADAPTER	GENERIC	15 PIN HD 'D' FEMALE
6	8 CLOSURE I/0 CARD 2	COMPUTERBOARDS, ADDR 314	37 PIN 'D' MALE
7	CPU AND SERIAL I/O	INDUST. COMPUTER SOURCE	9 PIN 'D'
8	HOST ADAPTER	FUTURE DOMAIN 850	SCSI (NOT USED)

V KEYBOARD COMMANDS

A) **PLAY COMMAND LIST**

KEY	FUNCTION
F1	Select play file
F2	Play current file
F3	Stop
F4	Repeat register = entry register (repeat forever=0)
F5	Chase incoming ltc
F6	Enter reader offset in timecode frames
SHIFT F6	Enter reader offset in film frames
F7	Set tach divider
F8	Set reader type, 0=ltc, 1=tach, 2=generator
F9	Freewheeler switch (nonzero plays to file end)
F10	Set user bits
F11	Set path
F12	Set timecode type, 0=30fps, 2=25 fps, 3=24 fps
+	Add entry register to start time (delay audio)
-	Subtract entry register from start time (advance audio)
=	Start time = entry register
Esc	Return to main menu

B) **EXAMPLES AND DESCRIPTIONS**

F1 (Select play file): F1 selects a play file for audio output. The F1 command prints a list of the available files, using the PATH and AUXPATH to locate the audio file directories. A prompt requests the file selection by number. Once a file is selected, the F1 function returns to the PLAY program.

F2 (Play current file): If a file has been selected, F2 will enable play. The READER display will not run until F2 has been pressed. In GENERATOR mode, the generator starts from the timecode value in the entry register if it is within the file start and end. Otherwise, the file start time is used. In TACH mode, the timecode starts from the file timecode start plus the reader offset. In LTC mode, the timecode is offset by the reader offset.

F3 (Stop): If a file is playing, keyboard command F3 stops play.

Shift F3 (Set end time and stop) This function is used for eliminating dead time at the end of files.

F4 (Repeat register=entry register (repeat forever=0)): If the timecode reader is in GENERATOR mode, files will repeat the number of times that is set in the repeat register. To set the repeat register, key in the desired value to the entry register. Press F4.

F5 (Chase incoming ltc): F5 sets the timecode reader to LTC READER mode. Incoming timecode selects the first file found with a starting time and ending time that contains the timecode. The file is opened and played. At the end of the file or if timecode stops, play stops, and the P8 returns to CHASE mode.

F6 (Set reader offset in timecode): The reader offset can be used for two functions. It is either the distance in timecode frames from the timecode reader head to the picture gate, or the run up time for a shaft encoder. Enter the offset in timecode, then press F6. This value is saved in EEPROM, and is recalled from EEPROM whenever power is cycled.

SHIFT F6 (Set reader offset in film frames): The reader offset can be used for two functions. It is either the distance in film frames from the timecode reader head to the picture gate, or the run up time for a shaft encoder. Enter the offset in integer film frames, then press SHIFT F6. This value is saved in EEPROM, and is recalled from EEPROM whenever power is cycled.

F7 (Set tach divider): When quadrature is used to drive the P8, the tach rate must be integer divisible to 30 hz, the timecode frame rate. The maximum tach rate is 2400 hz. Rates above 2400hz may lose counts. Key in the integer to divide the tach rate to 30

hz, and press F7. This value is saved in EEPROM, and is recalled from EEPROM whenever power is cycled.

F8 (Set reader type, 0=ltc, 1=tach, 2=generator): The reader type determines the sync source for the P8. When LTC is selected, either SMPTE, DTS timecode, or a low bit rate packed BCD timecode are read. The reader looks for one of the three types until the type is determined. When tach is being read, the tach is divided by the tach divider value to get the 30 hz frame rate. When the timecode reader is in GENERATOR mode, the 30 hz frame rate is generated from a crystal clock. This value is saved in EEPROM, and is recalled from EEPROM whenever power is cycled.

F9 (Freewheeler switch (Nonzero plays to file end)): The timecode reader has a two second freewheeler that continues after LTC or tach halts. The F9 function enables freewheeling to the end of file.

F10 (Set user bits): In the low bit rate LTC reading mode, TACH mode, or GENERATOR mode, the P8 outputs SMPTE. The F10 function allows the user bits of the SMPTE to be set to the BCD value in the entry register.

F11 (Set path): The F11 function sets the PATH and AUXPATH. When power is cycled, they are restored from the "P8.CFG" file or the default configuration if the "P8.CFG" file is not found.

F12 (Set timecode type): The timecode type must be 30fps for all playback to timecode applications. The F12 function is used only for setting different frame rates for recorder timecode triggers. This is used in European applications.

"+" (Add entry register to start time (delay audio)): The "+" function is usable only on hard disk systems, because it modifies the start and end times of the disk files.

"-" Subtract entry register from start time (advance audio): The "-" function is usable only on hard disk systems, because it modifies the start and end times of the disk files.

"=" (Start time=entry register): The "=" function is usable only on hard disk systems, because it modifies the start and end times of the disk files.

<Esc> (Return to main menu):

VI   SERIAL COMMANDS

A)   **COMMAND LIST**

PIONEER 8000 SUPPORTED COMMANDS IN P8 V1.26, TCR V1.22

COMMAND STRING		DESCRIPTION
"hhmmssff	PL"	play (end is optional)
"	SA"	start
"	PA"	pause
"	ST"	still
"dddddddd	UB"	set user bits
"hhmmssff	SE"	search
"hhmmssff	SM"	stop mark
"	CL"	clear
"argument	EK"	set echo, 1 = echo on, 0 = echo off
"argument	OF"	set offset
"argument	FW"	set freewheeler, 0=timeout, 1=freewheel to file end
"argument	SD"	set tach divider pulses per 30 fps tc
"argument	RT"	set reader type, 0 = ltc, 1 = tach, 2 = generator
"argument	RP"	repeat register, 0 = repeat forever
"	CH"	set chapter
"	?I"	tach divider request
"	?L"	directory request
"	?T"	time code request
"	?U"	user bits request
"	?C"	chapter (hour) request
"	?O"	get offset request
"	?P"	player mode request, returns motion status
"	?R"	reader type request
"	?H"	help request, prints this menu

Serial Rx errors

If a serial Rx error is detected, the P8 transmits E04<CR>.

B)   **EXAMPLES**

Typical command sequences:

SET CHAPTER

      CH 1 SE   chapter 1 search

CHAPTER REQUEST

      ?C   request current chapter

POSITION REQUEST

      ?T   returns the current timecode in ASCII

SET OFFSET

      30 OF   advance SMPTE timecode by 30 frames

SET ECHO MODE

      1EK   enable full duplex operation
      0EK   enable half duplex operation

C)   **ERROR MESSAGES**

      E04   feature not available
      E12   search error

VII EXTERNAL CLOSURE COMMANDS

A) **SEARCH 0 - SEARCH 9**

Making one these closures selects the corresponding chapter 0-9.

B) **START**

The START command closure starts from the audio file timecode start without the reader offset. This command would be used in a shaft encoder application where the film was already running. This permits trailers and other pieces of film to be added, and the corresponding sound tracks started. In CD-ROM systems, there must be at least two seconds of time between the START closure and first sound.

C) **PLAY**

The PLAY command closure plays from the audio file timecode start plus the reader offset. This command would be used in a shaft encoder application where the film was parked on a start mark, and a runup is needed before speed is attained.

D) **STOP**

The STOP command closure terminates audio output.

E) **READY N/C, READY N/O, READY WIPER**

If an audio file has been selected, but not started or played, the READY closure is made.

F) **PLAY N/C, PLAY N/O, PLAY WIPER**

If an audio file has been started or played, the PLAY closure is made.

VIII DISK STORAGE OPTIONS

A)   **<u>HARD DISK</u>**

The hard disk version of the P8 player boots like a normal DOS X.XX computer. The P8 program and configuration file typically reside in the \UTIL directory. The P8 program is started from the AUTOEXEC.BAT file with the following argument:

  P8 2

The argument selects the play item from the initial menu.

B)   **<u>CD-ROM</u>**

The CD-ROM version of the P8 player has a bootstrap ROM on the D0104 timecode reader card. It is a floppy disk emulation program called ROM-DOS. The bootstrap ROM contains a DOS 3.00 operating system, the Microsoft MSCDEX extensions for controlling the CD-ROM drives, and a bootstrap loader LOADP8.EXE that loads the P8 program from the first CD-ROM found. The default configuration of the P8 is set for CD-ROM, since it is not possible to modify a configuration file. There is an approximate 2 second file opening delay on CD-ROM. The start of the file needs to be at least 2 seconds of silence.

IX   SYSTEM FILES AND P8 SOFTWARE

A)   **CONFIG.SYS (CD-ROM VERSION, FD850 HOST ADAPTER)**

```
FILES=20
BUFFERS=20
DEVICE=FDCD.SYS /D:MSCD000
LASTDRIVE=F
```

B)   **AUTOEXEC.BAT (CD-ROM VERSION)**

```
PROMPT $P$A $A
MSCDEX /D:MSCD000 /L:E
LOADP8
```

C)   **P8.CFG (CONFIGURATION FILE AND DEFAULT)**

The P8 configuration file, "P8.CFG", is located in directory \UTIL. If there is no configuration file, the default is:

```
int FILM = 0;                           // read film or timecode
int DTS  = 0;                           // if 1, record to D drive
int AES  = 0;                           // AES or 3348 recorder
int OPTO= 1;                            // input optos present
int REELS = 64;                         // greatest reel number
char PATH[81] = "D:\\P8\\";             // a path
char AUXPATH[81] = "E:\\P8\\";          // another path
```

An example configuration file is given below:

```
DTS = 0;
AES = 1;
FILM = 0;
REELS = 99;
PATH = "C:\P8\";
AUXPATH = "D:\P8\";
```

D)   **P8 MAIN MENU**

The P8 main program menu has 5 selections:

F1) Record
F2) Playback
F3) Merge
F4) Loopthrough
F5) Exit

To invoke a particular selection from the DOS prompt, follow P8 with the F KEY of the selection. For player applications, the program LOADP8.EXE, which is run from the CD-ROM AUTOEXEC.BAT file, tries to load and run P8.EXE from the CD-ROM drive. When the program P8.EXE is found, the DOS command "P8 2" is executed, which loads P8.EXE, runs it, and selects "Playback" from the main program menu.

Functions "Record" and "Loopthrough" are used in the recorder. Function "Merge" is used to combine files in hard disk based systems.

E)   **DIRECTORY STRUCTURE**

<u>DISK FILE STRUCTURE ON CD-ROM</u>

```
\\                        the root directory
|
|_P8.EXE                  the P8 executable code
|
|_\P8                     the P8 audio file subdirectory
  |_R1T8.AUD
  |_R2T8.AUD
  |_R3T8.AUD              the P8 audio files (64 maximum)
```

<u>FILE NAMING</u>

```
R1T8.AUD _ audio file
 | |_____ number of tracks
 |_____ reel number
```

File names are assigned by the recorder. The ".AUD" extension is required for the files to be found by the player. The filename is a convenient way of checking for multiple reels of the same number, since only one reel of each number can be used.

<u>FILE HEADER</u>

The file header is a 92 byte C structure at the start of each file.

```
struct header
      {
      char            name[78];      /* title                 */
      int             reel;          /* reel number           */
      int             serial;        /* serial number         */
      int             tracks;        /* number of tracks      */
      unsigned char   start[4];      /* BCD start time        */
      unsigned char   end[4];        /* BCD end time          */
      };
```

F KEY	DESCRIPTION
F6	Set reader tc offset in tc frames
F7	Set tach divider (value to get 30 frames/second)
F8	Set reader type, 0 = ltc, 1 = tach, 2 = generator
F9	Freewheeler switch (nonzero plays to file end)
F10	Set user bits
F11	Set path
F12	Set timecode type 0=30 fps, 2=25 fps, 3=24 fps

X   ELECTRICAL SPECIFICATIONS

A)   **TIMECODE READER/GENERATOR**

TIMECODE INPUT:	balanced in, 100mV to 5V
TACH INPUT:	single ended in, TTL levels
TIMECODE OUTPUT:	single ended out, TTL levels

B)   **8 CHANNEL REPRODUCER**

PEAK OUTPUT LEVEL:	+14dB
REFERENCE LEVEL:	-6dB
DIGITAL SILENCE:	-85dB (all zeroes)
ANALOG SILENCE:	-70dB (recorded silence)

C)   **8 CHANNEL OPTO INPUT/ RELAY OUTPUT**

Please refer to the PDSCIO-8 manual.

XI   APPLICATIONS

A)   **TACH SLAVE**

The P8 can follow any tach rate that is integer divisible to a 30 hz frame rate.

1) Set the tach divider by keyboard or serial command.
2) Set the reader offset by keyboard or serial command.
3) Select TACH reader by keyboard or serial command.
4) Select a play file by keyboard, closure, or serial command.
5) At a known start, start the player by keyboard, closure, or serial command.

Transfers have been done starting 1 second before the pop, so that the pop is preserved for sync comparison purposes.

B)   **TIMECODE SLAVE**

1) Set the reader offset by keyboard or serial command.
2) Select LTC reader by keyboard or serial command.
3) Select a play file by keyboard, closure, or serial command.
4) Start the player by keyboard, closure, or serial command.
5) When LTC is read that is within the file start and stop, audio will start.

C)   **TIMECODE MASTER**

1) Set the reader offset by keyboard or serial command.
2) Select GENERATOR by keyboard or serial command.
3) Select a play file by keyboard, closure, or serial command.
4) Start the player by keyboard, closure, or serial command.

APPENDIX A - TIMECODE CHASE FACTS

Timecode chase mode is entered by setting the reader type to LTC, then putting the P8 in CHASE. This can be done either from the front panel or serial commands.
A) Front panel sequence: in the PLAY screen, press F5.
B) Serial command sequence:

COMMAND STRING	COMMENT
"0 RT"	// set reader type to ltc, chase
"0 SE"	// chase (alternate command if already ltc reader type)

The serial command "0 SE" is a special case of the SE command that enters chase mode.

If the P8 has been set to be an LTC reader, then it automatically enters CHASE on power up.

The P8 will go to SOURCE SYNC ROLL when a playing a file, or CHASE at any other time.

When timecode is RX'd, the first file found that has a start time less than the timecode and an end time greater than the timecode is played. This means that to operate correctly, no files should have overlapping timecodes.

When the P8 recordings are made, the recorder starts and ends on timecode triggers, which are saved in the file header as BCD timecodes.

Pressing **F3 (STOP)** puts the P8 in stop mode. Playing timecode at the P8 in stop mode will print the message 'no play file has been selected- can't play'. The P8 must be put in chase mode for timecode to select files.

APPENDIX B
70 mm TIMECODE / BRACKETS